Lee County

Jonesville, Virginia

Wireline E9-1-1
Costs & Options Analysis

August 20, 2002

GeoComm

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Executive Summary

General Introduction

This study represents an analysis of the emergency reporting system in Lee County, Virginia. The overall intent is to assist Lee County Government in determining whether or not to accept an offer from the Commonwealth of Virginia to totally fund the implementation of wire line Enhanced 9-1-1, provided that the County agrees to fund a portion of the monthly recurring costs for an Enhanced 9-1-1 system.

Geo-Comm, a 9-1-1 consulting and design engineering firm, conducted the analysis and developed this report over the course of a four-week period in July and August, 2002, under a contract with the Commonwealth of Virginia (Wireless 9-1-1 Services Board). Discussions were held with potential vendors, telephone companies, network providers, and county staff members over the course of this analysis. In addition, site visits were conducted by GeoComm team members as a means of examining and discussing the dynamics of the study and to address and qualify the expectations of the County.

The project team consisted of Paul Linnee, ENP (Project Manager) and Project Coordinators Norm Forshee, ENP; Glenna Johnson and Leon Agnew who conducted all necessary research, and worked cooperatively on the development of the findings and recommendations.

Paul Linnee was ultimately responsible for this final report.

The specific contracted tasking from the Commonwealth was as follows:

Scope of Work
Lee County: Wireline E-9-1-1 Assessment

1. Assess the PSAP in Lee County determining the type of hardware, software and network currently being utilized.

2. Develop an appropriate network design for an enhanced 9-1-1 (E-9-1-1) system for Lee County to include customer premise equipment, ALI database services and any other hardware and software required.

3. Determine the initial, non-recurring cost, monthly recurring cost and life cycle cost for the E-9-1-1 system taking advantage of any existing infrastructure.

4. Coordinate with the local exchange carriers serving Lee County in the development of the costs to ensure that the monthly recurring cost is kept to the minimum possible.

5. Determine the level of additional funding support that could be provided by the Wireless E-9-1-1 Fund should Highland select to implement wireless E-9-1-1 as well.

Methodologies

The information contained within this report represents generally “hard numbers”. This is to say that Geo-Comm contacted the local exchange service providing telephone company, E9-1-1 network provider, E9-1-1 location database provider, and other companies involved in each of the elements described in this report. These various organizations provided Geo-Comm with cost estimates based upon the information we gathered during our site visit and interviews with various staff members. An exception to this is those costs associated with the E9-1-1center equipment (which is generally called "CPE", which stands for "Customer Premise Equipment"), which is a non-regulated element, and is the only E-9-1-1 “piece part” for which costs are estimated. However, we used our recent experience in the publication of RFPs for and the review of proposals for this equipment elsewhere in developing these budget estimates.

Findings

● **Lee County currently has a no 9-1-1 service available for “wired” telephones in the County. (Wireless 9-1-1 calls are answered by the Virginia State Police)**

Any upgrades to the current emergency communications telephone system in the county would present a change in the manner in which the residents summon emergency assistance. Such a change would not be as major for Lee County as it often is elsewhere. Specifically, in Lee County today, persons requesting police, fire or emergency medical assistance all call one place (the Sheriff's office) from which these agencies are dispatched. With 9-1-1, the place that people call for assistance would not change, but the number they dial would. Also, the technology available to support the dialing of 9-1-1 would mean a major upgrade to emergency system reliability and capabilities for Lee County residents.

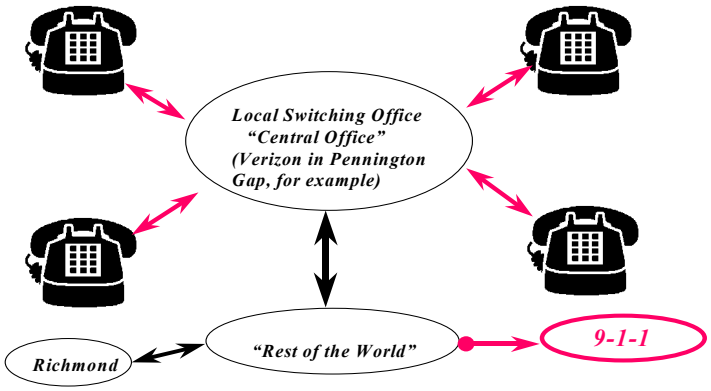
Any call requiring any public safety services (police, fire, Sheriff, ambulance, rescue, etc.) would be dialed to the digits 9-1-1. All such 9-1-1 calls would be answered in one location, and from that one location there would need to be the communications infrastructure in place to permit the answering 9-1-1 operator to be able to either radio dispatch, alert via pagers or direct the responders.

What is a 9-1-1 system?

Before we address this question, we need to develop a basic understanding of telephone networks. The following diagram should help:

Figure 2.1

Basic Telephone Network

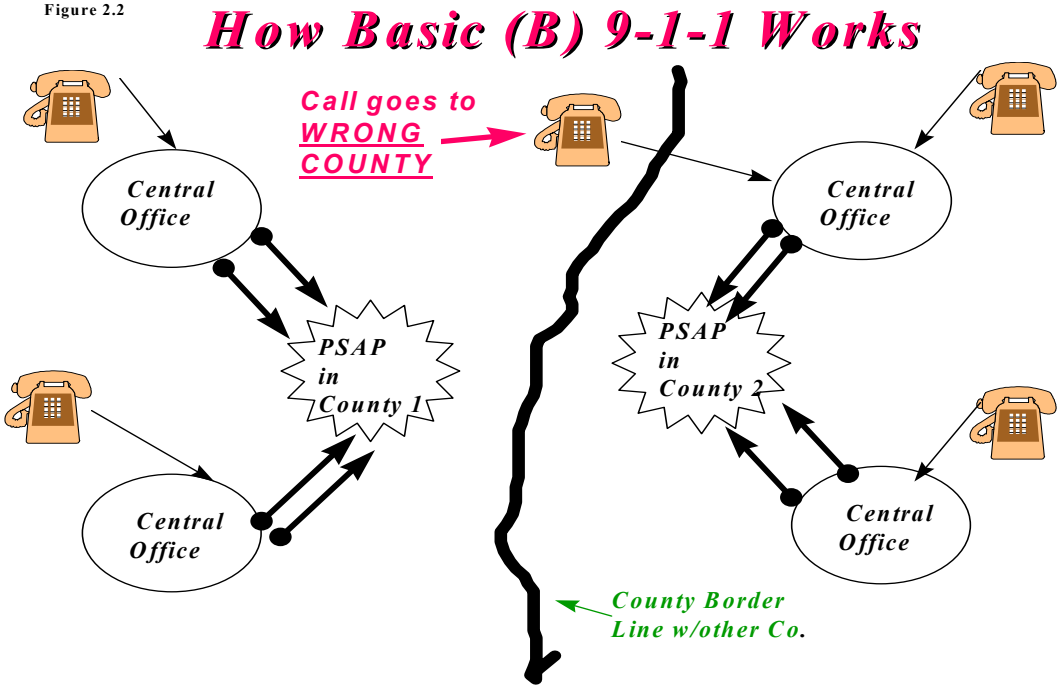


9-1-1 is an emergency telephone system and network that is available in two general configurations. They are:

- **B**asic or "B9-1-1".
- **E**nhanced or "E9-1-1".

The following discussion and diagrams will explain how B9-1-1 and E9-1-1 differ. In both, the term "PSAP" means **P**ublic **S**afety **A**nswering **P**oint, the place where 9-1-1 calls are answered, which is usually the County Sheriff's dispatch center.

Figure 2.2



A Basic 9-1-1 system is very simple technology which dates back to the mid 1960's. Simply put, with B9-1-1, one installs a set number of dedicated telephone lines (trunks) from each

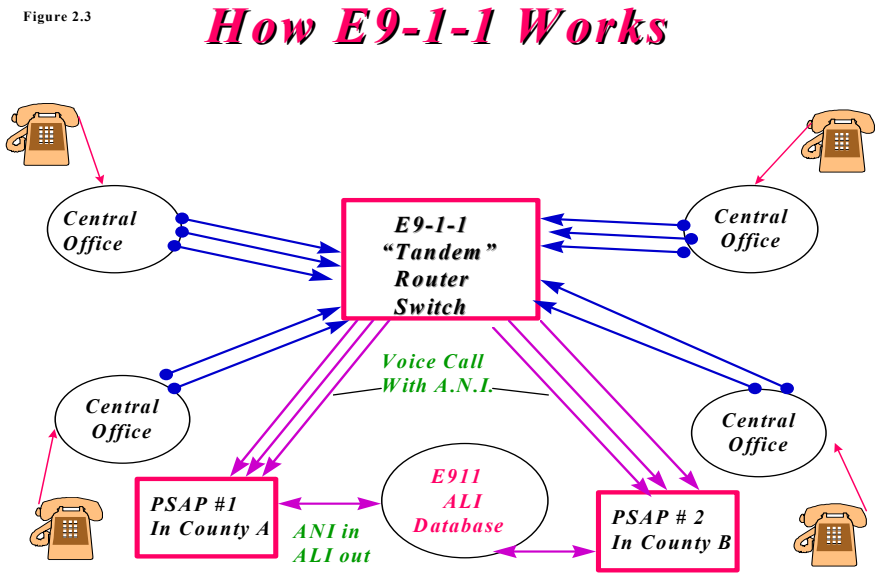
telephone company exchange office[1] within the county (usually a minimum of 2 such trunks) and runs those dedicated trunks to one location within the County, usually the County Sheriff's dispatch center. Then each of the telephone exchange offices is modified to accept the digits 9-1-1. Then, a phone is installed in the Sheriff's dispatch center on which there are as many "9-1-1 buttons" as there are trunks coming from the several local exchange offices in the County. If a party in Jonesville were to dial 9-1-1, their call would go from their phone to the Verizon local exchange office in downtown Jonesville, and then on these dedicated trunks to one of the (likely) 2 the buttons labeled "JONESVILLE 9-1-1". The Sheriff's dispatcher would then answer the line and conversation would ensure.

With a true B9-1-1 system, that's all you get. The voice call only. There are no provisions for the calling party's number to be provided to the dispatcher. This means that the dispatcher cannot call the party back in the event of a hang-up. It also means that the dispatcher has no reliable way of determining where the call is coming from, unless the caller can provide that information. Many 9-1-1 callers are panic stricken or cannot speak and, therefore, cannot provide this information.

Additionally B9-1-1 suffers from the inability to "selectively route" 9-1-1 calls to their proper county in cases where telephone company exchange areas cross county lines. Also, 9-1-1 calls received on a B9-1-1 line cannot be transferred to any other location.

ENHANCED 9-1-1:

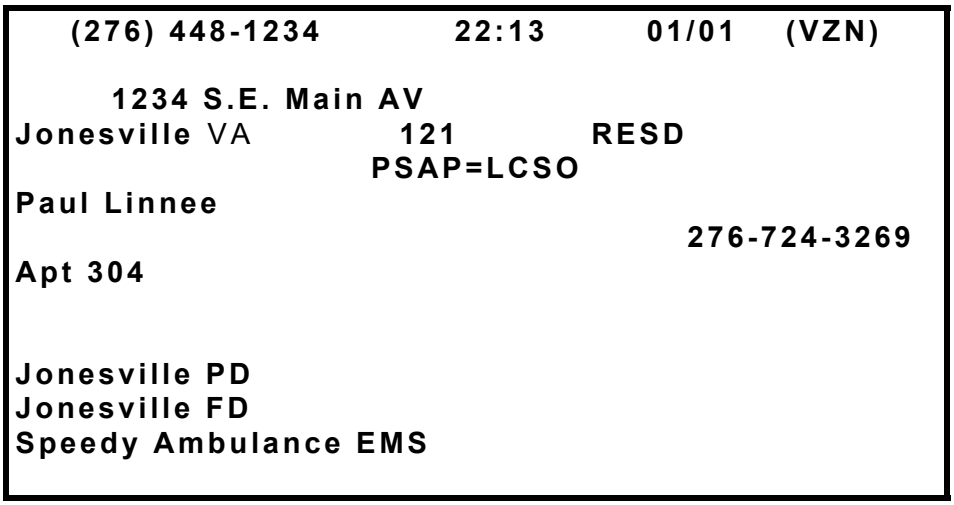
Figure 2.3



In the above diagram, the term **"ANI"** stands for **Automatic Number Identification,** which is the provision of the 9-1-1 caller's phone number to the dispatcher, even before the call is answered. It differs from commercially available "Caller ID" services (which are in use in the Lee

[1] *"Office" as used in this report is a telephone company term which refers to a "central office" or a "switching office" which are not really OFFICES, per se. Rather, a telephone "office" is a building within a town to which all the phone wires from all the phones in that town- and a large area surrounding that town – are connected. Calls placed within that area are switched within that "office". That "office" is subsequently connected by another set of wires to all of the other "offices" in nearby towns, and if a call is destined for another town, it goes from the local "office" to the distant town's "office" where it is switched to the lines serving the desired party's phone.*

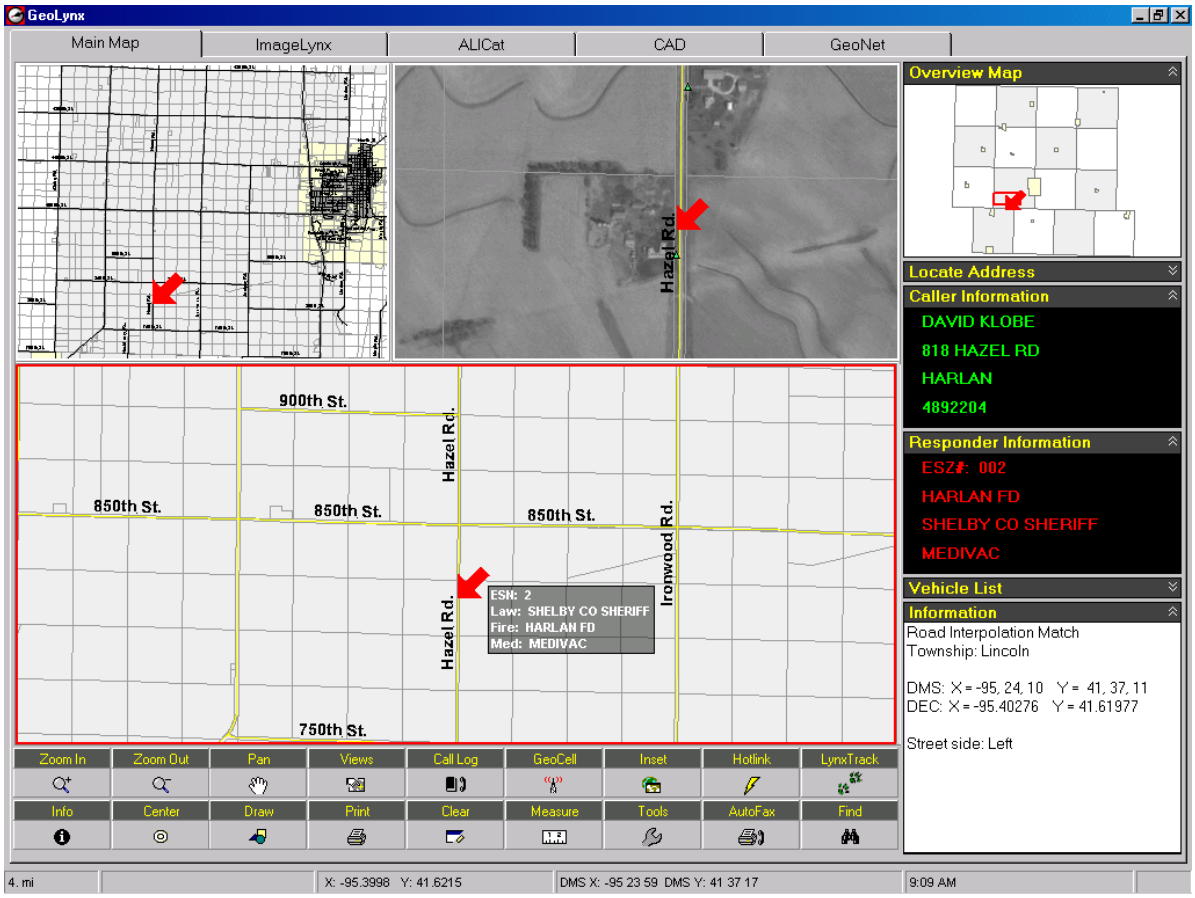
Co. Sheriff's office today on the 7 digit lines) in that it CANNOT be blocked by the calling party. The term, **ALI** refers to **Automatic Location Information**, which is a data screen presented to the dispatcher with the following information:



The data in the above screen provides the following information:

- Calling party telephone number (276-448-1234
- Time and date of the ALI data retrieval (22:13, or 10:13 p.m.) January 1
- Local dial tone service provider to the calling phone (VZN= Verizon)
- Address where this phone is installed (1234 S.E. Main Av. Apt 304, Jonesville)
- Type of phone service: (RESD = Residential service as opposed to Business or Pay phone, for example)
- Name of the party to whom the bill for this phone line is sent. (Paul Linnee)
- What "PSAP" this call should be routed to: (LCSO = Lee Co. Sheriff Office)
- Which are the appropriate police, fire and EMS response agencies for this address

This ALI data can automatically be fed into a GIS mapping display system to result in the ability to graphically depict the location of the wired E9-1-1 caller as follows: (four separate map views show a red arrow at the same location, that of the wired 9-1-1 caller at 818 Hazel Road in Harlan, Iowa)



Referring back to Figure 2.3 on a preceding page, we begin to also see one of E9-1-1's main attributes: ***SELECTIVE ROUTING***. Note that the 9-1-1 trunk lines from the several central offices no longer go direct to the PSAP as was the case in B9-1-1. Rather, with E9-1-1 they proceed direct over dedicated circuits (usually 2 per central office in rural environments) to a pair of devices called the ***E9-1-1 Tandem Router Switches*** (which we will refer to as the "tandems" going forward). These tandems (actually there are several of them in VA, TN, WV and KY operated by Verizon Communications) are located in Norton and Blacksburg, VA. (Note: Diagram 2.3 on the preceding page shows only one such Tandem for simplicity. In reality two are often used to provide redundancy in service)

When the dialed 9-1-1 call in an E9-1-1 system reaches its "primary tandem" (of the two tandems, one is primary and the other secondary for each Central Office), ***the caller's phone number precedes the call***. This phone number is then submitted to a "selective routing data base" (SRDB) in the tandem which answers the question (for example), *"I have an E9-1-1 call from 276-448-2401, to which of the several (or many) E9-1-1 PSAPs connected to me (the tandem) should I selectively route this E9-1-1 call?"*

This SRDB will have been built as a direct result of having built the ***"Master Street Address Guide"*** **(MSAG)** and having loaded the ALI records into the ALI data system. The process of constructing an MSAG flows directly from the development of "locatable addresses" within the County. (Lee County has not yet been fully addressed with "locatable style addresses".) The MSAG is essentially a "routing matrix" that identifies a street name, a range of theoretically possible house numbers for that street and which unique set of law enforcement, fire and emergency medical services providers are responsible for that address. For example, in an MSAG, the address for Rooster's Pub at 110 Harrell Street, in Pennington Gap would be referenced as follows:

Name	Type	Direction	Low #	High #	O/E	ESN	PSAP
Harrell	Street	N/A	100	1400	Both	101	LCSO

The fields in the above MSAG table are as follows:

Name: The name of the roadway. In this case Harrell.
Type: What type of roadway is it? Street, Ave, Lane, Drive, etc. In this case, Street.
Direction: Is it North, South, East or West? Not indicated here.
Low #: What is the lowest house number possible within this unique ESN? ***:100***
High #: What is the highest house number possible within this unique ESN? ***1400***
O/E: Does this unique ESN reflect ODD or EVEN house numbers, or both: ***BOTH SIDES***
ESN#: What number will be assigned to this area which has a unique grouping of Law enforcement, fire and EMS service providers? This is the ESN#. ***101***
(Note: ESN stands for Emergency Service Number)
PSAP: To which of several PSAPs served by this tandem should E9-1-1 calls from this ESN 101 be routed to? In this case it's the Lee County Sheriff's Office. (LCSO)

This MSAG table would go on for several pages, listing every roadway in the county, and for each roadway which passes through a different ESN, there will be another entry***. For purposes of illustration only***, State Road #612, which runs SW to NE in the Southern part of Lee County may pass through areas served by several fire departments. Assume *(this may not be accurate information)* that SR 612 Northeastward from the county line at SR 758 over to its intersection with SR 70 is covered by the Jonesville Fire Department, and Northeastward from SR 70 over to its intersection with US 58/421 is covered by the Duffield Fire Department in neighboring Scott County. In this case, then, the addresses from (example only) 1000 SR 612 Northeastward to 3999 SR 612 would be in an ESN (102, for example) for which the emergency responders would be the Lee County Sheriff, Jonesville Fire Department and Jonesville Ambulance Service (if there is one). Then the addresses from 4000 SR 612 Northeastward to 5999 SR 612 would be in an ESN (103, for example) for which the emergency responders would be the Lee County Sheriff, Duffield Fire Department, and Duffield Ambulance Services (if there is one). In this example, both of these ESNs could be "pointed to" the one PSAP serving Lee County, or the ESN for which the Duffield FD was a responder could be "pointed to" (or selectively routed) the Scott County PSAP, provided that Scott County implements wireline Enhanced 9-1-1, ***and provided that there is "inter-tandem connectivity" between the Verizon Enhanced 9-1-1 selective router tandem that will serve Lee County and the Sprint 9-1-1 selective router tandem that will serve Scott County***.

So, we have now established that a tandem performs the Selective Routing function based on the address associated with the caller's ANI, which **precedes** the E9-1-1 call through the network. ***This is critical, since "CALLER ID" type of data does NOT precede the call***

through the network. Caller ID requires that the call be delivered to a telephone device before the Caller ID is sent, between the 1st and 2nd ring. Therefore, Caller ID phone number data comes too late in the process to be effective as a call routing tool. Further, Caller ID can be blocked by the caller, making it not reliably available for call routing, even if it preceded the call through the network.

Once the E9-1-1 call is answered at the PSAP, that ANI is sent away over dedicated data circuits to a computer, which houses the ALI (caller location information) database. In the Lee County area of Virginia, this ALI database service is provided by Verizon Communications. The ANI arrives at the ALI database and "asks the question":

"***I am an E9-1-1 call from 276-448-2401, what do you know about me?"***

The ALI database checks for its record of 276-448-2401 and immediately returns an ALI display screen to the answering 9-1-1 operator at the PSAP and the ALI display populates as is illustrated earlier

This ALI database is updated (and it subsequently updates the SRDB in the tandem) generally on a 24 hour turn-around basis. It needs to be updated in this fashion because every day of the week people are adding phone lines, removing phone lines or changing the service address of an existing phone line when (for example) they move 1 mile down the road but keep their same phone number. Because there are already mechanisms in place in the "regular phone world" for this "move, add or change" information to be shared among telephone companies on a daily basis for purposes like Directory Assistance, and because telephone companies are very good at keeping track of the addresses where there services are installed *(they need to send out those monthly bills!)*, this process flows quite smoothly on an automatic basis. Generally, the only "maintenance work" that a County has to be involved with is to update the MSAG when new streets are added or lengthened, or street names are changed or when the unique grouping of emergency service providers for a given location change. (For example, Fire Department X and Fire Department Y "swap" some service territory.)

As can be seen from this discussion, E9-1-1 systems for "wired phones" are effective in:

- Causing for the 9-1-1 call to be able to go directly to the correct PSAP.
- Providing the answering 9-1-1 dispatcher with the caller's telephone number (ANI)
- Providing the dispatcher with a text display showing the address of where the calling phone is installed, the name of the subscriber for that line, and which unique grouping of emergency agencies are responsible for that address.

However, with the vast increase in wireless phones (mostly cellular phones), and the lack of a capability to graphically display the location of the 9-1-1 caller on a clear, complete and easy to read map, traditional E9-1-1 systems are about to become obsolete.

● **Fortunately, based upon recent technological advances, in tandem with a great reduction in the cost of sophisticated personal computers (PCs) and geographic information systems (GIS), the development of a new 21st century state-of-the-art E9-1-1 system is a now a cost-effective option for Lee County.** This is particularly true in light of the existing Commonwealth of Virginia program which allows counties to levy a surcharge of *up to* $3.00 per month (if required) on most telephone lines in the County, and to use the resulting revenues to implement and maintain these more sophisticated E-9-1-1 systems. With the

assistance of the State funding, Lee County now has an opportunity to progressively develop a highly sophisticated, cost effective 9-1-1 system that will much better serve the public safety community, as well as the general public well into the 21st century.

Findings:

Geo-Comm has determined that Lee County can immediately begin the process of implementing an E9-1-1 system. It is further recommended that the County develop a sophisticated GIS mapping database which can be used by 9-1-1 center personnel, as well as provide GIS capabilities to other county departments.

The County can develop an E-9-1-1 network utilizing the Verizon tandem switches in Blacksburg and Norton. The County can also contract with Verizon for the provision of the Enhanced 9-1-1 database and its maintenance. In addition, the County can publish competitive bid specifications for the E-9-1-1 terminal equipment to be located in the 9-1-1 center in Jonesville.

Other Related Issues: Historical foundation of why Lee County is considering E9-1-1.

Not all Virginia counties yet provide Enhanced 9-1-1 service to their residents. Not all counties in the USA provide Enhanced 9-1-1 services to their residents *(although fewer than 10% of the Nation's counties are now without 9-1-1service)*. Since the first 9-1-1 system of any type (B9-1-1) was implemented in 1968 (Haleyville, Alabama) and the first E9-1-1 was implemented in Oakland, California in 1976, there has been an ongoing public policy debate about whether or not any type of 9-1-1 should be made mandatory anywhere and/or everywhere.

Generally, such mandates have not been the purview of the Federal government. Generally, Cities and Counties are responsible to their State legislatures on matters such as 9-1-1. In some states, these legislatures passed a variety of "9-1-1 mandates". In some states, 9-1-1 or E9-1-1 was simply **mandated statewide** by a specific date and it was up to the cities and counties to comply, sometimes (but not always) with state funding assistance. In other states, laws were passed to permit 9-1-1 and permit cities and/or counties to levy "9-1-1 surcharges" or other such 9-1-1 specific taxes to pay for implementing and maintaining 9-1-1 systems.

Generally, Virginia has more closely followed this second model. Specifically, up until 1998 there was no mandate in Virginia for 9-1-1. Between 1998 and 2000, there was much activity in the 9-1-1 field in Virginia, mostly related to wireless (cellular phones) and their access to 9-1-1, and in 2000 the legislature passed Senate Bill 148 which contained the following language:

> *"On or before July 1, 2003, every county, city or town in the Commonwealth shall be operating a wireline E9-1-1 system, unless an extension of time has been granted by the Board."* *(Reference is to the Wireless E9-1-1 Services Board)*

The logic behind this action seems (to this outside observer) to have flowed from the awareness by the legislature of several facts:

1. That wireless 9-1-1 call volumes were overwhelming the dispatch centers of the Virginia State Police.
2. That many of these wireless 9-1-1 calls were dealing with non-highway incidents which were more appropriate for local PSAPs to answer.

3. That the Federal FCC had mandated that 911 calls from wireless phones must be processed according to new "Phase 1" and "Phase 2" standards very soon.
4. That if Virginia wanted some, most or all wireless 9-1-1 calls to go to local PSAPs, that local PSAPs would have to be equipped for E9-1-1 to be able to answer these new "Phase 1" and "Phase 2" wireless 9-1-1 calls.
5. That the question of whether or not local entities did or did not offer wireline E9-1-1 services was, therefore, a valid concern of the Wireless 911 Services Board, since no locality could answer the FCC mandated "Phase 1" and "Phase 2" wireless E9-1-1 calls unless they were already at least minimally equipped for Wireline E9-1-1 call processing.
6. That not all Virginia counties were providing E9-1-1 service to their constituents, nor did all have plans to do so.
7. That it was, therefore, logical for the Board to use its funds to assist the several counties without wireline E9-1-1 to implement it, so they could be the recipients of and provide service to wireless 9-1-1 callers in their area.

In addition to these actions by the Virginia Legislature, the U.S. Congress and the F.C.C. did not sit still. In 2000, the Congress passed and the President signed Senate Bill 800, which made it Federal policy that the digits 9-1-1 were to be the single unified emergency number throughout the USA. This action did not mandate universal 9-1-1 service throughout the USA, however. Technically, it did mandate 9-1-1 for wireless phones *(which are under exclusive Federal purview since they use Federally licensed radio frequencies and are not controlled by the various State Public Utility commissions such as Virginia's Corporation Commission)*. Also, in 2001, the FCC issued an order to the wired local telephone exchange carriers over which it has authority (FCC 01-351) nationwide. This order required these local exchange carriers *(local telephone companies which provide dial tone services to every home and business in the USA)* to "enable" the digits 9-1-1 in their local exchange equipment, and ensure that calls dialed to the digits 9-1-1 from that local exchange would be answered somewhere, and the designated somewhere would be appropriate for the answering of emergency calls from within that area. This requirement is scheduled to be in place by September 11, 2001. ***(9-1-1 by 9/11 is what it is called by many)***

Importantly, this is NOT "9-1-1 service".

Specifically, it is (in most cases) going to be "call forwarding" of calls dialed to the digits 9-1-1 to some 7digit number that may or may not be answered at the Sheriff's office, the local police station or fire station or hospital or funeral home or nursing home. It does NOT provide for the benefits of ANI (although it may be equipped with "Caller ID") and will not provide the benefits of ALI. It cannot be selectively routed, and does not operate on special, dedicated circuits. ***It also does not qualify as wireline E9-1-1 as required in Virginia State Law.***

Also in 2001, the Virginia Legislature acted again on this matter and passed HB1611 which exempted from the 7/1/2003 wireline E9-1-1 implementation mandate any county which did not have a local wireline E9-1-1 surcharge (Lee County did not and does not yet have such a surcharge) and is less than 50% served (geographically) by wireless telephone service.

Therefore, Lee County may not be required to implement wireline E9-1-1 service if it is not at least 50% covered by wireless telephone services. The determination of the percentage level of wireless service coverage is not spelled out in State law or Wireless 911 Board policies, and in any event, such a determination is an extremely subjective matter. It may be that a county is 55% covered for a wireless phone carried outdoors, and 51% for the same phone when used

inside a car, 53% if that phone in the car is connected to an external antenna, and 38% for the same phone when used inside a house and 29% when the same phone is used inside a building such as a school and on and on.

For example, the Lee County serving carrier ALLTEL shows this map on their web site, where the darker gold color represents areas where the ALLTEL system provides "coverage", and the lighter color where the user has to "roam" over to another carrier's system for coverage. By either definition, ALLTEL clearly wants the user to believe Lee County is well covered.

This is probably less an issue of an accurate depiction of wireless coverage than somewhat deceptive advertising. But, more to the point, a simple search of the internet for ***"who are the wireless carriers available in zip code 24263 (Jonesville)?***" also reveals GLOBALSTAR**,** a provider of satellite based phone service, which arguably provides wireless phone coverage over 100% of the entire world, since it uses satellites instead of cell towers on the ground. Granted, satellite phone services are not covered by the FCC's rules for wireless 9-1-1, but to a subscriber or user, such a phone looks and acts very much like a regular cell phone.

Another web search on a link provided by the FCC asked the question: "***What carriers are licensed to provide service to zip code 24263?"*** It got this response:

24263 [LEE COUNTY, VA]

The companies listed below are licensed to provide your area with wireless phone services. It is highly recommended that you contact these companies directly for the latest information on services, rates, coverage, special deals and the availability of services in your area. [more info]

Ask questions and get opinions about wireless services in your area.
Click here for the **Southern** U.S. wireless phone service Forum

SUNCOM
SunCom - Member of the AT&T Wireless Network
877-CALL-SUN

SYSTEM: 1900 MHz TDMA | SERVICES: TEXT MSG

VERIZON WIRELESS
We never stop working for you. (SM)

SYSTEM: 800 MHz AMPS CDMA

CRICKET COMMUNICATIONS

SYSTEM: 1900 MHz CDMA

NEXTEL

SYSTEM: 800 MHz iDEN | SERVICES: TXT MSG INTERNET

CINGULAR WIRELESS

SYSTEM: 1900 MHz AMPS GSM

ALLTEL

SYSTEM: 800 MHz AMPS CDMA

SUNCOM

SYSTEM: 1900 MHz TDMA | SERVICES: TEXT MSG

NTELOS

SYSTEM: 1900 MHz CDMA	

ELISKA WIRELESS

SYSTEM: 1900 MHz	

SPRINT PCS

SYSTEM: 1900 MHz CDMA	SERVICES: WIRELESS WEB

SPRINT PCS

SYSTEM: 1900 MHz CDMA	SERVICES: WIRELESS WEB

IMPORTANT NOTE: We are not saying that all of these carriers are providing service in Lee County today. In fact, it is likely that only Verizon Wireless and Alltel provide much meaningful service coverage. (Ntelos, Verizon and Alltel all "claim" they have service in Lee County according to the VA Wireless 9-1-1 Board's web site) BUT, all of the above are licensed and at any time could begin to provide service, and their decision to do so will not be bound by any County decisions. It will likely be 100% economic. If a given carrier either sees a revenue opportunity by operating a site in Lee County, or (more likely) an expense reduction opportunity (so they don't have to pay roaming surcharges to some other carrier when one of their subscribers is in the area) they will do so.

So, to us, the question of 50% coverage is something of a moot point. If Lee County isn't "50% covered" today (by at least some definition) it will be some day in the near future, and to the person who is a wireless subscriber, all they know is that the coverage is "100%" for where they are making a cell call that is going through. Furthermore, when that coverage level is met, the current state law exemption from implementing E9-1-1 will no longer apply, and it is not known that the current funding support from the Wireless Board will still be available.

We need to reiterate an important point: *If Lee County does NOT implement wireline E9-1-1 capabilities, Lee County cannot receive wireless 9-1-1 calls with the all important call back number and general location data (Phase 1 wireless 9-1-1) and caller's precise location (Phase 2 wireless E9-1-1). This could mean that a Lee County resident would be able to dial 9-1-1 from their wall phone and have their call forwarded to the 7 digit number in the Sheriff's office ("FCC 9-1-1", not real E9-1-1), but if they run out of their house with their cell phone and dial 9-1-1 to follow up on the event they 1st reported from their wall phone, they would be answered by the State Police, and mass confusion would result.* ***This is a serious disaster waiting to happen****.*

In addition to the fundamental question of ***Should Lee County Implement Wireline E9-1-1?*** there are several other, and equally important considerations that need to be looked into. These are:

1. In any scenario, are there any improvements needed to the public safety communications infrastructure in Lee County to ensure that a 9-1-1 call (wherever and by whomever it is answered) can be properly handled in terms of complete and effective radio communications and paging/alerting for the dispatch, direction and control of the appropriate response agencies?

2. Are there any personnel or training issues directly related to the implementation of E9-1-1 for Lee County?

We will deal with each of these questions separately as follows.

• We believe that the question of whether or not Lee County should implement E9-1-1 for its residents and visitors has been answered with a resounding "YES" in the previous pages.

• **As it relates to the question of whether Lee County should build and operate its own E9-1-1 PSAP**, the County should be comforted in the awareness that this fundamental question has been asked *(and answered in a variety of ways!)* by virtually every political subdivision (cities, states and counties) which has faced E9-1-1 implementation in the USA.

From the narrow perspective of the E9-1-1 telephone <u>network only</u>, it needs to be understood that with an E9-1-1 network, it makes little or no difference where the destination PSAP is, who manages it and what kind of people (sworn or civilian) work there. For example, in the State of New Hampshire, there is only one E9-1-1 PSAP for the entire State and it is operated by the State Government. There, the State E9-1-1 PSAP answers the E9-1-1 call and then transfers it to the local police and/or fire dispatchers throughout the state. At the other extreme, in the State of California, in the Los Angeles metro area alone, there are over 200 E9-1-1 PSAPs with just about every small suburban city of 10,000 or more residents having their "own" E9-1-1 PSAP and dispatchers. Similarly, in Greater Chicago, there are well over 150 such city and county and "special district" E9-1-1 PSAPs. On a more local level, in Virginia, nearby Carroll and Grayson Counties and the City of Galax share joint control and management of a "regional PSAP" with all the E9-1-1 calls from both counties being answered in Galax.

Therefore, the question of whether the County should build and operate its own E9-1-1 PSAP is, essentially, ***a political question.*** This means that the technical question of where the PSAP should be is generally a non-issue. However, the "political aspects" of this question are many and varied, with a couple of technical aspects still needing consideration. For example:

Q. If there was an E9-1-1 PSAP <u>NOT</u> in Lee County, but answering Lee County E9-1-1 calls (either on a "purchase of services" basis or as a part of a "joint powers control board") would Lee County retain its Sheriff's dispatchers so that these remotely answered E9-1-1 calls could be transferred back to the 7 digit line in Jonesville for dispatching by them?

Q. If Lee County were to receive dispatching of all calls from the same remote E9-1-1 PSAP and the Lee County dispatchers were no longer required for call dispatching, who would oversee any Lee County lock-up (if there is one)? Who would run local records checks, state license checks, etc. for Lee County Deputies and officers? Who would answer the administrative phone at the Lee County Sheriff's Department?

Q. If Lee County were to either purchase E9-1-1 call answering and dispatching services from some other agency or share in the costs of such a joint operation, would the costs of this arrangement be more or less than whatever would be saved by personnel reductions possible at Lee County? If the savings equaled or exceeded the costs, what benefits, in terms of services to the public or department or conveniences would Lee County be giving up?

Q. If there was an E9-1-1 PSAP NOT in Lee County, but answering Lee County 9-1-1 calls, would that PSAP's radio system be adequate for communicating with all the Lee County public safety units from some remote distance? If not, how much would it cost to upgrade to that capability? (It is highly likely that some significant costs would be incurred here, especially considering Lee County's challenging terrain).

Q. Who would control the performance and accountability of the 9-1-1 dispatchers under a "purchase of services" agreement or in a Joint Powers agreement?

To quote an author who once commanded the New Your City Police Department's Communications Bureau, ***"He who controls communications, controls the police."***

The answers to these and other questions must be thoroughly debated by all of the "stakeholders" in this process.

However, it is our general analysis, experience and recommendation that some sort of general "Regional Public Safety Services Organization" could be considered. Such an organization could be "general" in nature, meaning that it could be the organizational foundation under which future "shared services" could be housed

● ***In conclusion on this topic, however, regardless of whether the concept of some form of "service sharing" has any political appeal, it is still our analysis that Lee County can afford and should implement E9-1-1, even if its E9-1-1 PSAP and dispatching operation stay independent.***

As it relates to the communications infrastructure to support a Lee County E9-1-1 PSAP, there is some work that needs to be done.

While it is outside the scope of this current analysis project and report to specifically identify the tasks and modifications that need to be undertaken, suffice it to say that the radio communications infrastructure in place in Lee County is likely in significant need of upgrading, not to "make E9-1-1 work", so to speak, but to ensure the capability to effectively contact, dispatch and provide services the public safety agencies required by the 9-1-1 caller.

The following photos are intended to depict the general state of technology (which is low) in the Lee County Sheriff's current dispatch center.

Lee Co. Sheriff's Dispatch Center

Lee County Sheriff's Dispatch Center

Rack of Caller ID displays for 7 digit lines at Lee Co. dispatch center

(Preceding photos) In general, this work area is nothing more than a secretarial desk on top of which (and behind) some communications equipment has been placed. The computer screens behind the desk are for access to the State of Virginia criminal records and motor vehicle records systems.

The work area and its equipment has no meaningful security, inadequate redundancy and questionably reliable power service in the event of electrical failure.

As it relates to the question of additional training required for E9-1-1 dispatchers, this is a widely misunderstood issue. Specifically, it needs to be remembered that Lee County today has dispatchers. They receive calls for all sorts of incidents and emergencies and handle them with the training and skills they currently possess. ***By merely implementing E9-1-1, one does not increase the number of incidents that are being reported to these dispatchers, their severity or complexity.*** In fact, by implementing E9-1-1, one is actually reducing the time and "investigation" required of the dispatcher to handle those incidents that are reported. By providing the dispatcher with the party's telephone number (ANI), their location (ALI), a graphic computer map depicting where the caller is located in the county (GIS Dispatch Mapping) and (perhaps) GPS based Automatic Vehicle Location to not only guide the responders to the scene, but also to help the dispatcher in estimating their time of arrival and, thereby, better managing the caller's expectations, the dispatcher's task in many ways becomes easier and more efficient.

The actual training in how to understand the E9-1-1 network and system and to use the new E9-1-1 PSAP equipment can be handled in a matter of hours. However, there is one caution on training: It can be argued that the implementation of E9-1-1 may raise the expectations of callers for certain services. For example, (and largely due to such popular TV shows as ***"RESCUE 9-1-1"***) many 9-1-1 callers have come to expect that the answering dispatcher is trained, equipped and has the time to provide what is generally referred to as ***"Medical Emergency Pre-arrival Instructions"***. Simply put, this is the act of the dispatcher diagnosing the medical condition the caller is reporting by following a set or "medical protocol" cards or "pup up screens" on their E9-1-1 PSAP equipment terminal. Then, (assuming the caller is willing and co-operative) the dispatcher provides verbal instructions to the caller as to what remedial and sometimes life-saving steps to take at the scene with the victim, according to the same protocols. We have been involved with numerous instances where this type of service has at least appeared to have a true life-saving effect in such cases as child birth, choking and occasionally heart stoppage. The "art" of providing these services is generally referred to as **EMERGENCY MEDICAL DISPATCH or EMD**, and one definitely needs training and strong policy guidance in this field. The State of Virginia also has certain training requirements for 9-1-1 dispatchers which will need to be met.

Costs for E9-1-1 Service

As has been previously discussed, the State has previously projected the total cost for implementing wireline E9-1-1 in Lee County to be approximately $522,500. This total would include the costs for rural addressing, developing maps, doing street signage, purchasing 9-1-1 CPE (telephone equipment at the PSAP) and installing the E9-1-1 network elements. The Wireless 9-1-1 Board has offered to pay this entire cost for Lee County, provided that the County agrees to pick up costs not covered in the above, as well as any monthly recurring costs going forward.

As a part of the current study, GeoComm has also independently estimated the likely costs for implementing wireline E9-1-1 in Lee County. Our estimate closely matches the earlier State estimate. GeoComm estimates $529,300.

The following costs were developed by GeoComm via conversations with telephone company officials, by reviewing current E-9-1-1 tariff information on file at the Corporation Commission in Richmond, a review of mapping and addressing service costs, street signage and by conducting an analysis of Geo-Comm's most recent PSAP equipment bid lettings. We have determined and/or estimated the following costs:

ITEMIZATION OF INITIAL COSTS		
ITEM	**One Time Cost**	**Annual Service Contract**
Current state of the art Computer Telephony Integration (CTI) E9-1-1 PSAP telephone system (2 positions) capable of handling wireless Phase 1 and 2 E911 calls	$125,000	$15,938
VOICE RECORDER	$30,000	$3,825
DIGITAL MAPPING SYSTEM	$10,000	$1,275
UPS SYSTEM	$4,000	$510
MISC MATERIALS	$9,500	$0
KEY TELEPHONE	$5,000	$637
SERVICE INITIATION COSTS FOR "BUNDLED" E911	$1,930	0
SERVICE INITIATION COSTS FOR SELECTIVE ROUTING, ANI and ALI SERVICES	$23,870	0
RURAL ADDRESSING AND MAPPING (Approx.)	$200,000	0
STREET SIGNS AND HOUSE MARKERS	$120,000	0
TOTALS	**$529,300**	**$22,185**

In addition to one-time costs for E9-1-1, there are also monthly costs that are either required or highly recommended. The monthly costs from the 9-1-1service providing telephone company (Verizon in the case of Lee County) are covered by their rate tariff with the Virginia Corporation Commission. Additionally, one should either budget funds for equipment service contracts or for "time and materials" maintenance of this mission critical equipment, as well as building up an equipment replacement reserve fund. Finally, since an E9-1-1 system is essentially a "living entity" that is only as good as the quality of the data and the MSAG, and the degree to which addressing is kept updated accurately, along with GIS map data, it is highly recommended that any E9-1-1 system be overseen by a staff 9-1-1 Coordinator. The following is our projection of these costs.

ACTIVITY	MONTHLY COSTS ***AFTER COMPLETION*** County Would Pay (with some State assistance)
"Bundled" E9-1-1 Service from Verizon based on $113 per 1,000 "main stations" per month - using a Verizon estimate of 11,000 such main stations (11 x $113)	**$1,243.00**
Monthly breakdown of annual service-maintenance costs on equipment from previous page ($22,185/yr over 12 mos.)	**1,849.00**
Replacement amortization costs *(building reserve fund to pay for equipment replacement after 10 years of service)* of $164,000 spread out over 180 months (15 years).	**911.11**
Monthly cost of staff, office, equipment and supplies for **half-time** 9-1-1 coordinator function for the County as well as address, sign and MSAG maintenance tasks. (Avg. over 10 years assuming an annual 5% increase)	**2,250.00**
MONTHLY TOTAL:	***$6,253.11***

It should be noted that (according to figures obtained from Verizon) there are about 9,800 *"9-1-1 surcharge eligible"* telephone "main stations" located in Lee County. (Telephone Company and government lines are exempt) If Lee County were to implement a 9-1-1 surcharge of 65¢ per month, per line (far below the State maximum of $3.00 per month) $6,370 per month would be raised to cover the monthly recurring costs listed above. ***Importantly, this 65¢ surcharge on wired lines would create some TAX EQUITY between what Lee County residents who are only subscribing to wireless phones (and more will do this going forward) and are paying the State 75¢ in 9-1-1 surcharge, and those who have wired service.***

Availability of State Wireless 9-1-1 Funds To Help Defray Recurring Costs:

Virginia also provides a favorable program for helping defray some of the costs of operating a 9-1-1 PSAP, ***provided the PSAP agrees to and accepts wireless 9-1-1 calls as well***. Simply put, the Board presumes that a certain percent of all work and equipment costs at an E9-1-1 PSAP are attributable to wireless E9-1-1 calls, and since local PSAPs do not collect 9-1-1 surcharge from wireless phones (only from wired phones in their jurisdictions) but the State

does (at 75 cents per cell phone per month) the State has agreed to provide funding support from these surcharge collections back to the local PSAPs where the wireless 9-1-1 calls are being answered. The process of calculating this funding level involves either actual comparison between that PSAP's wired 9-1-1 call count and their wireless 9-1-1 call count (if the PSAP has such base line data), or a reasonable projected estimate of what that level would be. Absent the ability to make a reasonable projection (which would likely be the case for Lee County which has no experience for wired or wireless 9-1-1 call levels) the State has agreed to a minimum of 10.42% of the overall County general fund expenditures, with a minimum of $30,000 per year.

Using this assumed 10.42% minimum, Lee County could assume not less than $652 per month from the Board as 10.42% of the projected $6,253.11 monthly costs. Additionally, personnel costs that are not paid by the State Compensation Board (but are paid by local funds) are also eligible for this wireless 9-1-1 funding assistance. For example, if the County had 5 full time dispatchers *paid by local funds*, plus a half-time 9-1-1 coordinator, at a total annual cost of (for example) $225,000, then the minimum 10.42% matching figure would net $23,445 in funding assistance from the wireless E9-1-1 fund each year.

► But, with the $30,000 minimum, the $30,000 would be the applicable amount. So with a monthly projected recurring cost of $6,253.11 x 12 months = $75,037.32, minus a not less than $30,000 contribution from the State, we have a net annual cost of $45,037.32, which divided by 12 months equates to $3,753.11 per month. If the County wanted to keep a potential 9-1-1 surcharge at an absolute minimum (with little margin for error), a 39¢ per month 9-1-1 surcharge would generate just enough money per month.

BUT: We do not recommend this. First, there is a trend nationwide for the number of "main stations" against which local 9-1-1 surcharges can be levied to go down. More people are replacing wired with wireless phones, dropping 2nd lines for computer use and replacing them with cable modems or DSL service for "broadband internet access", etc. If Lee County were to set their surcharge at 38¢, there would be no margin for error.

Importantly: Before any of this wireless 9-1-1 funding is available to Lee County, the County must:

1. Be able to accept wireless E9-1-1 calls.
2. Accept such calls as a Primary PSAP (1st place they are answered)
3. Implement wireline E9-1-1 so as to be able to process wireless 9-1-1 calls

Why another "tax"? This is one of the issues that is certain to be raised in Lee County's discussion of this issue. To assist in putting this issue into its proper perspective, we have reproduced from the Virginia Corporation Commission's web site the following information, which clearly identifies that many dollars (as many as $14 per month) on little known and less understood fees are placed on phone bills by various entities today. It is our belief that when compared to the SLCC and PICC and LNP type charges, an E9-1-1 surcharge will be easily understood and accepted by the telephone bill payers, and will be far less than almost any relative they have in almost any other county in the USA would be paying. ***For less than the cost of one pay phone call per month, the residents would have E9-1-1 service and all that it can promise.***

The following 2 pages were excerpted from: http://www.state.va.us/scc/division/puc/phonefacts.htm

The State Corporation Commission continually receives calls from Virginians with questions and complaints about the long list of "add-on" fees appearing on local telephone bills. Their confusion is well founded. The various taxes, fees and assorted charges now amount to one-third, and for some customers over one-half, of the total monthly bill for basic local telephone service.

In Virginia, the cost of a residential telephone line is roughly $10 to $20 per month depending on where you live and the company providing the service. That is the regulated portion of the local bill that pays for the dial tone you hear when you pick up the handset and for local calls you make and receive. Yet, telephone customers are presently paying up to $14 in additional monthly charges as a result of federal, state and local mandates.

While many of these surcharges are telecommunications related, they do not directly pay for the cost of providing basic local telephone service. Instead, they pay for certain "public purpose" goals and/or services that have been defined by actions of Congress or the Virginia General Assembly. The cost of these programs may be passed on directly to telephone customers as surcharges on the local phone bill.

Subscriber Line Charge *("SLC," pronounced "slick")*

www.fcc.gov/cib/consumerfacts/SLC061500.html

$5.00 for a single line; $7.00 for each additional line

This is an end-user charge implemented by the Federal Communications Commission (FCC), currently set at $5.00 per month for primary residential lines and $7.00 for secondary residential lines (multi-line business rates are even higher). This charge is intended to recover a portion of the interstate costs associated with a subscriber's local telephone line to access the interstate long distance network. It helps keep interstate long distance rates low. The State Corporation Commission has not established a similar intrastate charge.

Presubscribed Interexchange Carrier Charge *("PICC," pronounced "pixie")*

www.fcc.gov/cib/consumerfacts/PICCchanges.html

As of July 1, 2000, the presubscribed interexchange carrier charge was eliminated for residential lines and single-line businesses. However this charge remains for multi-line businesses. This is another charge established by the FCC. It is a flat, per-line charge from local telephone companies to interstate long distance carriers to recover the remaining portion of the interstate cost of a local telephone line not recovered through the SLC.

Universal Service Charges

www.fcc.gov/cib/consumerfacts/universalservice.html
Varies depending on company

Telephone subscribers also may be seeing charges on their local, long distance and cellular bills for universal service. These companies are required by the FCC to contribute to a federal universal service fund to support telephone service for high-cost areas, low-income subscribers, schools, libraries, and rural health care providers. Even though the FCC did not direct these companies to pass these charges along to their customers, many have chosen to do so. These universal service fees vary by amount and structure, and by company. For example, AT&T charges residential customers 9.9 percent of customers' interstate long distance bills and calls it a Universal Connectivity Charge; MCI calls it a Federal Universal Service Fee and charges 8.3 percent; Sprint calls it a Universal Service Carrier Charge and charges 8.6 percent. ***For local companies, Verizon Virginia (formerly Bell Atlantic) charges 35¢ per month, Verizon South (formerly GTE) charges 32¢, and Sprint (Centel & United) charges 30¢. All call it a Federal Universal Service Charge.***

Local Number Portability Charge

http://www.fcc.gov/cib/consumerfacts/localport.html
Varies depending on company

This is another charge authorized by the FCC. It is a monthly, per-line charge from local telephone companies to pay for the technology that allows consumers to keep their phone numbers if they switch to another local telephone company. Previously, anyone deciding to change had to get a new number, and this was determined to be a barrier to effective competition. The number portability charge appearing on customers' bills varies by company

For example, Verizon Virginia charges 23 cents per month; Verizon South charges 36 cents per month.

Public Rights-of-Way Fee

63¢ per line

A law passed by the 1998 Virginia General Assembly authorizes this monthly charge to appear on customer bills in some parts of the Commonwealth. The fee pays for telephone company access to the rights-of-way of public property. City and County governments and the Virginia Department of Transportation incur expenses when phone companies need to disturb streets and highways to install or repair lines.

Virginia Relay Center Fee

16¢ per line

This fee pays for a service that allows people who are deaf, hard-of-hearing or speech disabled to use the telephone network where operators relay messages either electronically to disabled persons or verbally to hearing persons. Relay service was authorized by legislation passed in 1990 by the Virginia General Assembly. The service was subse quently mandated nationally by Congress with the passage of the Americans with Disabilities Act.

E911 Tax

Varies by locality

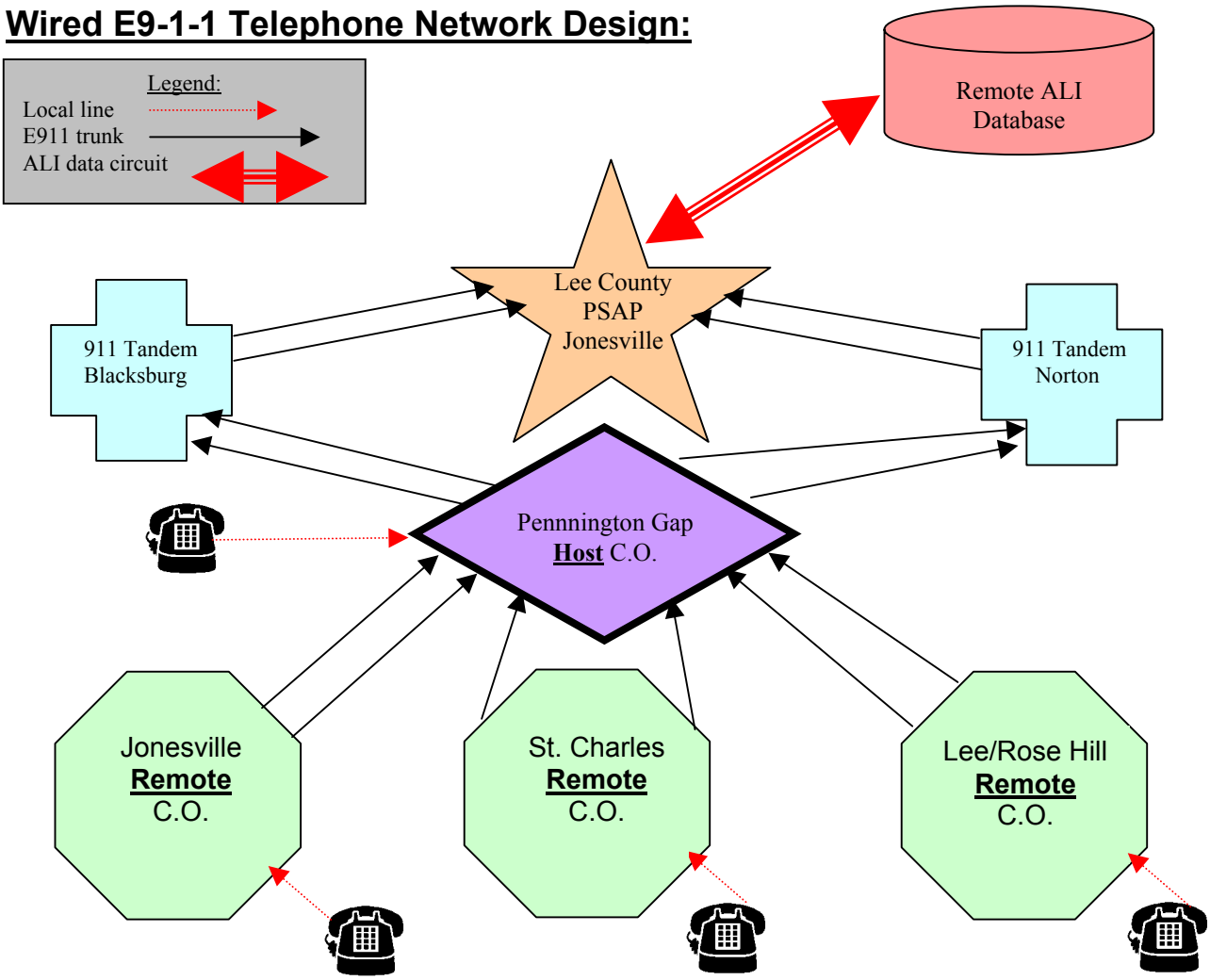
Authorized by the Virginia General Assembly, this tax is imposed by localities to pay for the cost of an emergency response communications system that identifies both the caller and the location of the call. The tax rate is set by the locality. The General Assembly also authorized a 75¢ per month charge on wireless telephone customers. This money will pay for highly sophisticated equipment that pinpoints, by satellite, the location of a wireless 911 caller.

Miscellaneous Taxes

Varies by level of phone usage

Like many other goods and services purchased by consumers, certain telephone services are taxed by federal and local governments. There are state taxes, too, but the state gross receipts tax and the Virginia regulatory tax are included in the basic local rate and do not appear as separate items on the bill.

Wired E9-1-1 Telephone Network Design:



Implementing enhanced 9-1-1 with selective routing would ensure that all calls originating within the county are answered in the appropriate location at either the 9-1-1 center in Jonesville or at their proper home PSAP.[2]

Wired E9-1-1 Telephone Network Recommendation: - Geo-Comm recommends that Lee County implement an E-9-1-1 telephone network design centered around the Verizon tandems located in Blacksburg and Norton.

[2] This selective routing process relies heavily on the implementation of locatable addresses throughout the county, as well as the implementation of E9-1-1 with selective routing in neighboring jurisdictions, **as well as "inter-tandem connectivity"** between the Verizon E9-1-1 tandem and the Sprint E9-1-1 tandem that will serve Scott County, along with either "mirrored" ALI data between the two systems or the capability of the two PSAPs to do look ups in each other's ALI data systems.

Database Storage and Retrieval System

9-1-1 Caller Location Information (LI) must be obtained, loaded into a computer and must be updated on a regular (daily) basis as phone subscribers are added, removed or changed. The two general options pertaining to the location of this information are to place it on a computer at the 9-1-1 PSAP (on-premise database) or to house it remotely (remote Automatic Location Information or "ALI" database).

At the onset of E9-1-1 service in locations similar to Lee County (in the late 1980's and early 1990's) the use of on-premise ALI data systems was somewhat popular. However, *their use is now largely not recommended* for several reasons. Among these, the most important is their relative inability to effectively interact with the soon-to-come wireless E9-1-1.

Simply put, whereas wired ALI records are static (individual ALI records do not change throughout the day) wireless ALI that will accompany "Phase 1" and "Phase 2" ALI records will be **dynamic.** This means that as each wireless 9-1-1 call is passed to the PSAP, it will have to be dynamically updated to contain (at a minimum) the wireless caller's 10 digit cell phone call-back number, and (in Phase 2) that caller's unique latitude and longitude information. This level of dynamic change to the ALI record demands that the ALI database be almost constantly "on-line" with the somewhat national providers of this wireless ALI data, and if a PSAP uses an on-premise ALI data system, the national wireless carriers (or their agents for this wireless ALI data) will not be willing or able to have constant communication with this far away "on premise" ALI database.

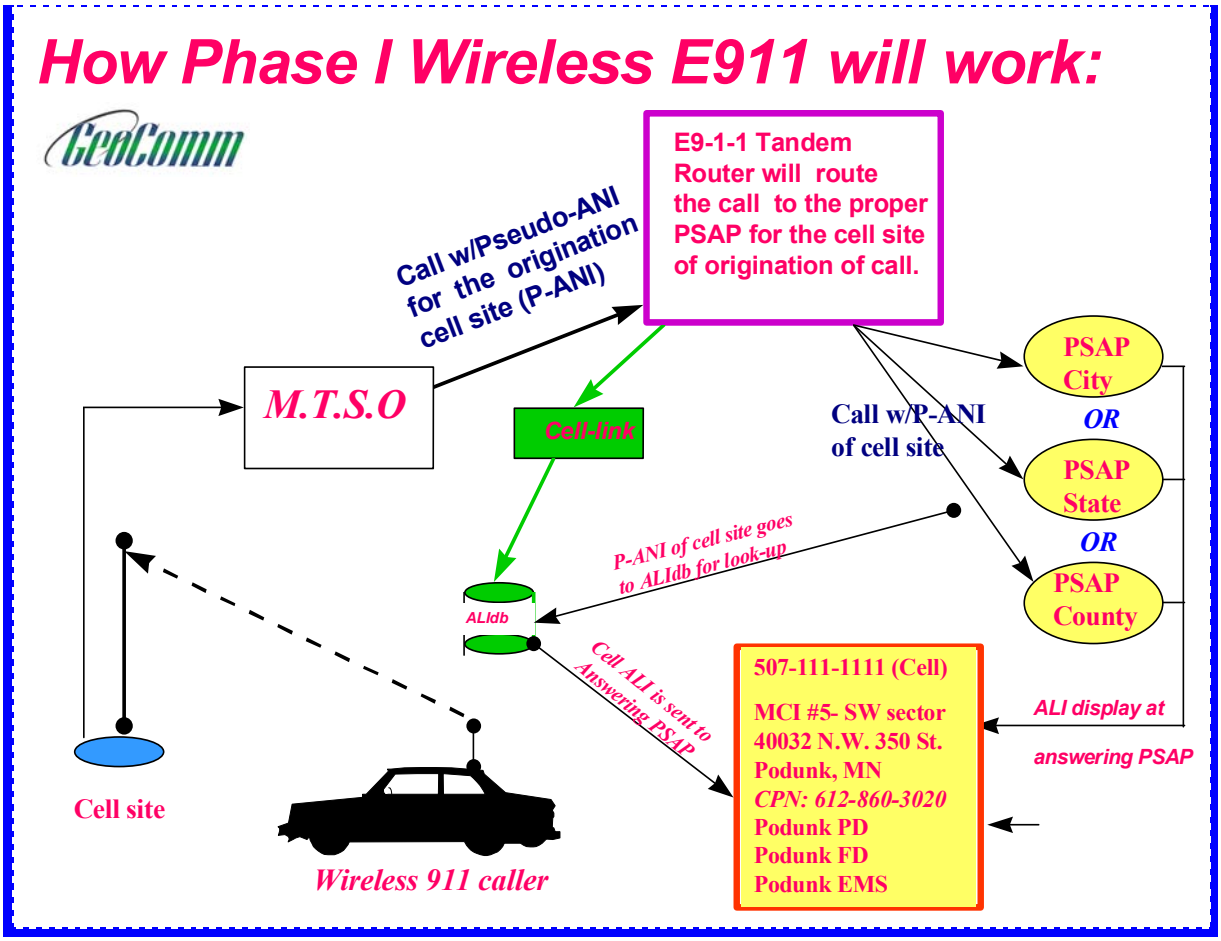
On-premise ALI database systems have also proven to be difficult for PSAPs to manage from a technical perspective. To possess an on-premise database is to functionally become a part of the telephone industry. The requirement to coordinate the gathering of telephone service changes from all of the operating telephone companies in the county on a daily or weekly basis is self-evident. It has been our experience that it is not unusual for an on-premise database system to be as much as 40% inaccurate within the first five years of operations. Further, unless the ALI records being input into the on-premise ALI database are "scrubbed" against and verified by an appropriate MSAG process, the occurrence of invalid address data with ALI records is unacceptably high.

Database Location Recommendation: - There is currently only one vendor authorized to offer this service in this part of Virginia: Verizon. Therefore, it is recommended that the county contract with Verizon for this service. It is further recommended that the County have the requisite rural addressing completed to ensure that all ALI records contain addresses that are instantly locatable by emergency responders as well as plottable and displayable on a PC based GIS map.

Wireless E9-1-1 Network

As of this writing, the vision of the E9-1-1 network for wireless (cellular) E9-1-1 calls is complete and is being implemented throughout the USA. It is known that this new network, ***to the greatest extent possible***, integrates into the existing and proposed for installation wired E9-1-1 networks of the state. **Importantly: No PSAP will be able to receive wireless E9-1-1 calls, either on initial answer or via a transfer from another PSAP with wireless E9-1-1 data intact unless they are connected to an E9-1-1 network Tandem Router**. There are two "phases" to Wireless 9-1-1 implementation. Phase 1 provides the PSAP with the calling cell phone's general location as represented by the cell tower (and its sector, if there is one) and 10

digit call back number. Phase 2 adds the caller's specific latitude and longitude location to that data.

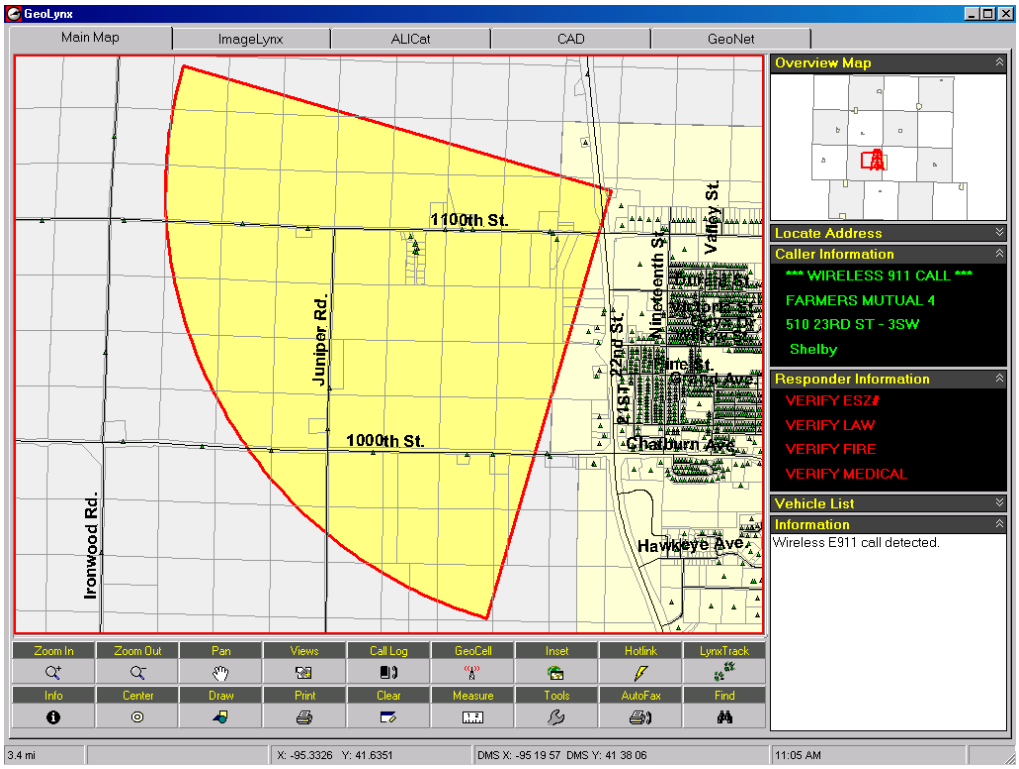


Locating Wireless E9-1-1 Callers

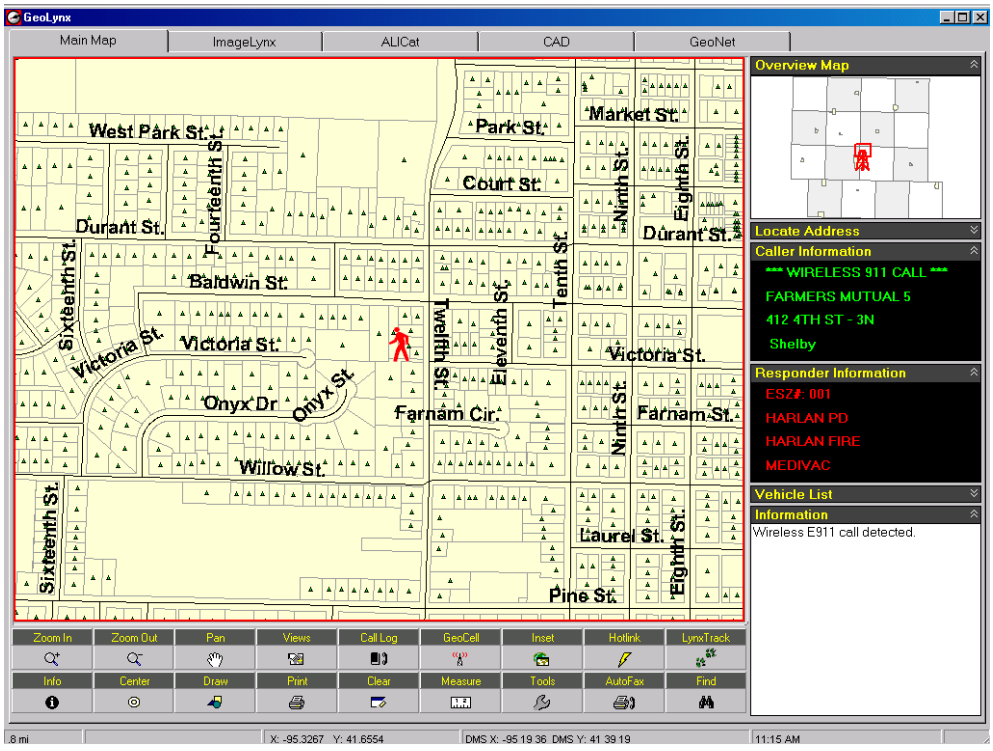
Geo Comm is recommending that Lee County also equip itself to be an eventual PSAP for Wireless E9-1-1 calls. Current statistics indicate that as ***many as 50% of all phones in service in rural America are now Cellular phones, with the numbers rising significantly each year.***

Using the same GIS mapping display system referenced in our earlier discussion of wireline 9-1-1, we can see how a "Phase 1" caller location can be depicted. In the following example, the caller would likely be located within the shaded yellow area representing the radio coverage area of one of three "sectors" of a cell tower.

Phase 1 caller location:



Phase 2 caller location (using wireless carrier provided latitude and longitude):



Rural Addressing

Rural Addressing Recommendation Geo-Comm recommends that Lee County conduct a thorough audit if its locatable addressing system, and complete it as required, to insure a uniform level of public safety services throughout the county. This will be a prerequisite to the development of the MSAG.

Street and other Signage

It is common knowledge that intersection signs and house numbers signs are useful as a means of directing emergency responders and other service providers. These signs often constitute approximately 1/3 of the costs of development in an Enhanced 9-1-1 system. In retrospect, it seems odd that such a technically sophisticated system as an E-9-1-1 system requires such a large expenditure for such unsophisticated products as street signs and residential markers, but if one remembers that the entire purpose of E9-1-1 is to enable emergency responders to find emergencies, it is a process involving the communications element of providing the responders with a locatable address, and the practical element of enabling the responders to find that address in the real world.

These signs are typically very expensive. This higher expense for signs in the rural areas is due to their greater size and much higher reflectivity when compared to signage in towns and cities. This is due to the higher speeds traveled in the country and the relative lack of background lighting. Installation and particularly maintenance of these rural signs is more involved than city signs due to the effects of the forces of nature in the country.

In addition to street signs, there is also the prospect of proving residential markers to a rural driveway locations. These signs are less reflective and require less extensive installation procedures.

Signing Recommendation: The County should implement complete and high quality intersection signage as well as residential address marker signs.

E-9-1-1 Database Development (MSAG)

The Master Street Address Guide (MSAG), is an ancillary database that, when interfaced to the E-9-1-1 telephone record data, provides the accurate police, fire and ambulance service assignments to send to the scene. In addition, the MSAG also involves that process used to establish and maintain an accurate E-9-1-1 primary database.[3] With the possible exception of the rural addressing program, the MSAG and database development process is the most detailed and time consuming element of an E-9-1-1 project.

This MSAG development process is generally a partnership between the county and its addressing/MSAG development service provider and the company chosen to provide the remote ALI database. The county has the option of conducting the MSAG and database building process utilizing county staff members or it can contract with a company to accept the database building responsibilities as their agent.

[3] *Geo-Comm defines E-9-1-1 database development as both the development of the MSAG and the succeeding clarification of the telephone records. This later aspect is far and away the most difficult part of the entire process.*

Lee County does not have current or experienced staff members capable of freeing up the necessary time required to handle this work. This is also a process requiring a unique experience and skill set

An option is to contract with an outside firm to provide for the initial building of the 9-1-1 MSAG database and do the rural addressing. An outside firm would have individuals experienced in the development of 9-1-1 MSAG data, would not require initial training and could be expected to complete the process in far less time and more accurately than an individual not experienced or trained in the process.

MSAG Recommendation: Geo-Comm recommends that Lee County contract with an outside firm to build the E-9-1-1 database and do the rural addressing, as well as the required coordination with the Postal Service and the telephone company which will host the ALI database.

CONCLUSIONS

Design Summary

Geo-Comm has recommended that Lee County contract with Verizon for its E-9-1-1 network and the remote E-9-1-1 ALI database. We have also recommended the purchase of 9-1-1 equipment and the addressing of the county. Finally, the recommendation has been made to not attempt to create the E-9-1-1 database and MSAG via county staff, but to outsource this function to the private sector.

General Lee County E9-1-1 Upgrade Program Components:

- ⇒ **Accept the State's offer to fund the up front costs of wire line E9-1-1**
- ⇒ **Implement an approximately 65¢ per month wired 9-1-1 surcharge immediately**
- ⇒ **Implement Verizon Tandem Telephone Network**
- ⇒ **Remote Database Storage and Retrieval System**
- ⇒ **Integration of Selective Routing (where available)**
- ⇒ **"CTI" Wireless 9-1-1 compatible PSAP equipment**
- ⇒ **GIS Mapping with ALI link for wired and wireless ALI data**
- ⇒ **Implement Cellular 9-1-1 call mapping system**
- ⇒ **Outsourcing of Database Development**

Appendix 1 - Glossary

Sophisticated E9-1-1 Features

Specialized features available at the tandem control office that further enhance the E-9-1-1 system are as follows:

Selective Routing : Selective routing provides the capability to route a 9-1-1 call to the primary PSAP deemed to be appropriate for the call originating telephone number. Selective routing is based on either the office code (NXX), the number group (thousand's digit) or the automatic number identification (ANI) telephone number of the originating station. With wireless 9-1-1 "Phase 1" calls, selective routing is achieved at the cell site or antenna coverage sector level, meaning that all wireless 911 calls originated through a given cell tower or portion of that tower's coverage area can be routed to a PSAP deemed to be the most likely proper PSAP. With "Phase 2" wireless 9-1-1, it is expected that this selective routing will be done on the basis of the caller's specific latitude and longitude location (within certain complex parameters).

Default Routing: Default routing is a standard arrangement with E-9-1-1 service which provides the capability to automatically route a 9-1-1 call to a designated (default) PSAP (or some designated location) either when selective routing is not provided or when selective routing is provided but a particular 9-1-1 call cannot be selectively routed for any reason. This helps to ensure the proper routing of a majority of the E-9-1-1 traffic if a problem occurs within the E-9-1-1 network.

Alternate Routing: Alternate routing is a standard service available for each PSAP that provides the capability for a traffic busy PSAP to have 9-1-1 calls alternate route to a designated location. With alternate routing, if all trunks to a particular PSAP are traffic busy or the PSAP is out of service due to an emergency (fire in the PSAP, etc.), 9-1-1 calls normally routed to that particular PSAP can be automatically alternate routed to either a designated seven digit telephone number assigned for that purpose, or to a designated alternate E9-1-1 PSAP (another County, for example) with the understanding that once said alternately routed call is answered elsewhere, that elsewhere will need some capability to dispatch that event. Thus E-9-1-1 traffic could be re-routed from the Lee County Sheriff's Office to an alternate location should a circumstance arise that restricted the Sheriff's Office's ability to answer incoming 9-1-1 calls.

Central Office Transfer: Central office transfer is a standard feature that provides the capability for an established 9-1-1 call to a PSAP to be transferred via the tandem router to another PSAP or some desired other destination by the answering dispatcher. A call transfer is accomplished via a 3-way conference, which permits a 3-way connection to be established between the calling party, the dispatcher and the desired destination. This is especially effective for circumstances where one county 9-1-1 Center must transfer an E-9-1-1 call to an adjacent center to allow for dispatch of the neighboring county's emergency services to the caller's location.

Interface to ALI Data Management System (DMS): This feature provides the interface that allows the tandem control office to communicate with a remote E-9-1-1 database or Data Management System (DMS) for the purpose of providing Automatic Location Identification (ALI) data and generation of selective routing update data.

Forced Disconnect: Forced disconnect provides the capability for a dispatcher to release a 9-1-1 call connection even though the calling party has not hung up.

Trunk Consolidation: Trunk consolidation is accomplished in a control office or router. This feature allows the combining of several incoming 9-1-1 trunks from the end switching systems into a smaller group of outgoing trunks that terminate at the PSAP. Sizing of the outgoing PSAP trunk group is based on the number of access lines that will be served by the 9-1-1 system. Trunk consolidation plays a major role in the Lee County system. This process reduces the number of trunks installed at the PSAP location thus significantly reducing the costs of the PSAP equipment installed at the Sheriff's Office.

Database Development

Many of the counties that already have E-9-1-1 utilize a remote database system located typically at a telephone company to manage their E-9-1-1 data. Here the telephone record data, which is the heart of the E-9-1-1 database, is loaded and maintained for the county.

When a 9-1-1 call is made, the trunks deliver the caller to the answering point where the audio is presented to the dispatcher. Simultaneously, the E-9-1-1 equipment installed at the Sheriff's Office strips off the caller's telephone number and re-sends this information via data links to the database provider's computer. There the ANI is compared to the E-9-1-1 database where a match is made to a telephone record. The location information and other pertinent information is then sent via the data link back to the county for display at the communications center.

Conventional 9-1-1 Center Equipment

For the address, telephone number and other pertinent information to be of use at the communications center, equipment is installed that can de-code this information and present for use by the dispatcher. In state of the art 9-1-1 centers, this equipment typically takes the form of sophisticated, digital telephone equipment which terminates the 9-1-1 trunk lines and links the communications center to this data via cabling into the 9-1-1 center itself. In the 9-1-1 center some type of video display to provide for the address, telephone number and emergency agency information.

This equipment is offered by a variety of different non-regulated vendors. The equipment has as its principle characteristics a central processing unit, the requisite intelligence to "Talk Back" to the 9-1-1 sending office, the requisite intelligence to de-code the telephone number and location information and video display terminals which may or may not possess additional central processing capabilities. At present, additional more sophisticated equipment capable of searching and displaying additional information stored within its central processing unit is available and should be sought in any procurement process. A Telephone Device for the Deaf (TDD) must also be included in the PSAP equipment configuration to ensure compliance with the Americans with Disabilities Act (ADA).

Tasking restatement and conclusions:

Scope of Work
Lee County: Wireline E-9-1-1 Assessment

1. Assess the PSAP in Lee County determining the type of hardware, software and network currently being utilized.

   There is no E9-1-1 hardware, software, or network in place in Lee County.

2. Develop an appropriate network design for an enhanced 9-1-1 (E-9-1-1) system for Lee County to include customer premise equipment, ALI database services and any other hardware and software required.

   The recommended E9-1-1 network and ALI database system has been designed.

3. Determine the initial, non-recurring cost, monthly recurring cost and life cycle cost for the E-9-1-1 system taking advantage of any existing infrastructure.

   The non-recurring and monthly and life cycle costs of the system have been determined.

4. Coordinate with the local exchange carriers serving Lee County in the development of the costs to ensure that the monthly recurring cost is kept to the minimum possible.

   The appropriate Verizon tariffs have been researched and applied in an industry standard network design.

5. Determine the level of additional funding support that could be provided by the Wireless E-9-1-1 Fund should Lee County select to implement wireless E-9-1-1 as well.

   Lee County would be eligible for recurring funding assistance of at least 10.43% (with a minimum of $30,000/yr.) of their recurring costs under the assumption that wireless calls will represent at least that percentage of their total 9-1-1 call load. Should actual experience exceed that level, the funding share provided by the Wireless 9-1-1 Services Board can be increased.